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10/812,254

03/29/2004

James A. Mott

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SUN MICROSYSTEMS, INC.
c/o PARK VAUGHAN & FLEMING, LLP
2820 FIFTH STREET
DAVIS, CA 95618

EXAMINER

VU, THONG H

ART UNIT

PAPER NUMBER

2616

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/812,254

Applicant(s)

MOTT, JAMES A.

Examiner

Thong H. Vu

Art Unit

2616

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

1. Claims 1-41 are pending.
2. This is a co-pending of applications 10/811642 and 10/812,200.
3. Claims 1,14, 17, 23,27 and 33 objected to because of the following informalities:
 - Claims 1,14,17 claimed a first queue pair, first virtual lane, a first bucket without any special characters or any second component in comparison. Thus the limitation "first" does not carry any significant weight and considered as any queue pair, virtual lane or bucket, etc.
 - Claims 23, 27 barely mention to a first queue and first linked list.
 - Claim 33 merely mention to bucket and linked list.Appropriate correction is required.

Double Patenting

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

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Claims 1-41 are provisionally rejected on the ground of nonstatutory double patenting over claims 1-45 of copending Application No. 10/812,200 ('200). This is a provisional double patenting rejection since the conflicting claims have not yet been patented.

The subject matter claimed in the instant application is fully disclosed in the referenced copending application and would be covered by any patent granted on that copending application since the referenced copending application and the instant application are claiming common subject matter, as follows:

('200) 1. In a communication device coupled to an InfiniBand network and an external communication system, a method of transferring a communication from the InfiniBand network to the external communication system, the method comprising:

receiving packets for each of multiple queue pairs terminating at the communication device; for each of said queue pairs:

reassembling (i.e.: associate) in a shared memory contents of said packets into communications to be transmitted to the external communication system ;and

maintaining an associated linked list identifying locations in said shared memory in which said communications are reassembled; and

when a communication is reassembled for a first queue pair, identifying to a transmission module (i.e.: a virtual lane) a portion of a first linked list associated with said first queue pair, wherein said first linked list portion identifies shared memory locations in which said communication was reassembled.

(Application '254) 1. A method of buffering InfiniBand queue pairs in a single memory structure, comprising:

receiving an InfiniBand packet comprising a portion of a communication to be transmitted on a non-InfiniBand communication link;

identifying a first queue pair to which the InfiniBand packet belongs;

identifying a first virtual lane to which said first queue pair belongs;

storing said portion of the communication in a first bucket of a single memory structure, wherein said single memory structure is configured to store contents of InfiniBand packets received from multiple queue pairs; and

for each of the multiple queue pairs, including said first queue pair, maintaining an associated linked list of buckets (i.e.: entries) in said single memory structure in which contents of InfiniBand packets belonging to the queue pair are stored.

Furthermore, there is no apparent reason why applicant would be prevented from presenting claims corresponding to those of the instant application in the other copending application.

Claim Rejections - 35 USC § 103

Claims 1-16 and 33-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goldenberg et al [Goldenberg 7,245,627 B2] in view of Malek [6,785,775 B1].

5. As per claim 33, Goldenberg discloses An apparatus for storing contents of InFiniBand packets of one or more communication streams [Geldenberg, InFiniBand fabric, Fig 1, col 9 lines 15-30], comprising:

a receive module configured to receive InfiniBand packets from one or more communication streams [Goldenberg, an InFiniband controller receiving messages, col 11 lines 9-26];

a single memory structure [Goldenberg, single TCA, Fig 2, col 9 lines 45-56],
a control structure configured to facilitate management of said linked list [Goldenberg, an InFiniband controller, col 11 lines 9-26; linked list, col 13 lines 49-55].

However Goldenberg does not explicitly detail
wherein for each of the one or more communication streams, buckets (entries) of said single memory structure in which contents of packets of the communication stream are stored are linked via a linked list associated with the communication stream;

In the same endeavor, Malek taught a method and apparatus for improving the scheduling of a data processing system using a cache coherency mechanism and an alternative approach to the utilization of a single header cache line (or single memory structure) wherein the multiple entries can be queued via a linked list [Malek, col 7 line 45-col 8 line 4, Fig 8];

Therefore it would have been obvious to an ordinary skill in the art at the time the invention was made to incorporate the entries or buckets of said single memory structure in which contents of packets of the communication stream are stored are linked via a linked list as taught by Malek into the Goldenberg's apparatus in order to utilize the single memory structure.

Doing so would provide mechanism for managing quality of service to multiple hosts sharing a NIC.

6. As per claim 34, Goldenberg-Malek disclose said control structure comprises an entry corresponding to each bucket of said single memory structure; and each said entry in said control structure is configured to identify a next entry in said control structure and a corresponding next bucket in said single memory structure [Malek, col 7 line 45-col 8 line 4, Fig 8].

7. As per claim 35, Goldenberg-Malek disclose each of said linked lists comprises the buckets of said single memory structure in which said contents of packets of the communication stream are stored; and for each said bucket in said single memory structure, a corresponding entry in said control structure [Malek, col 7 line 45-col 8 line 4, Fig 8].

8. As per claim 36, Goldenberg-Malek disclose for each linked list associated with a communication stream: a first pointer identifying the beginning of said linked list; and a second pointer identifying the end of said linked list [Goldenberg, pointer, col 13 line 41, col 16 line 67].

9. As per claim 37, Goldenberg-Malek disclose said single memory structure is a multi-port random access memory component [Goldenberg, multiple ports, col 13 line 26].

10. As per claim 38, Goldenberg-Malek disclose said control structure is a multi-port random access memory component [Goldenberg, multiple ports, col 13 line 26].

11. As per claim 39, Goldenberg-Malek disclose said control structure is configured to enable the one or more communication streams to make full use of said single memory structure [Goldenberg, NIC appears as a single TCA, col 9 line 54].

12. As per claim 40, Goldenberg-Malek disclose the communication streams are virtual lanes [Goldenberg, virtual lane, col 2 line 64].

13. As per claim 41, Goldenberg-Malek disclose the communication streams are queue pairs [Goldenberg, queue pairs, col 10 line 45].

14. As per claim 1 Goldenberg discloses A method of buffering InfiniBand queue pairs in a single memory structure, comprising:

receiving an InfiniBand packet comprising a portion of a communication to be transmitted on a non-InfiniBand communication link [Goldenberg, Infiniband 24 and WAN 30, Fig 1];

identifying a first queue pair to which the InfiniBand packet belongs [Goldenberg, queue pair, col 10 line 45; scheduling queues, Fig 5];

identifying a first virtual lane to which said first queue pair belongs [Goldenberg, virtual lane, col 2 line 64];

However Goldenberg does not explicitly detail storing said portion of the communication in a first bucket of a single memory structure, wherein said single memory structure is configured to store contents of InfiniBand packets received from multiple queue pairs; and for each of the multiple queue pairs, including said first queue pair, maintaining an associated linked list of buckets in said single memory structure in which contents of InfiniBand packets belonging to the queue pair are stored.

In the same endeavor, Malek taught a method and apparatus for improving the scheduling of a data processing system using a cache coherency mechanism and an alternative approach to the utilization of a single header cache line (or single memory structure) wherein the multiple entries can be queued via a linked list [Malek, col 7 line 45-col 8 line 4, Fig 8];

Therefore it would have been obvious to an ordinary skill in the art at the time the invention was made to incorporate the entries or buckets of said single memory structure in which contents of packets of the communication stream are stored are linked via a linked list as taught by Malek into the Goldenberg's apparatus in order to utilize the single memory structure.

Doing so would provide mechanism for managing quality of service to multiple hosts sharing a NIC.

15. As per claim 2, Goldenberg-Malek disclose for each of the multiple queue pairs, maintaining a first pointer configured to identify the beginning of the associated linked list; and a second pointer configured to identify the end of the associated linked list [Goldenberg, a linked list, col 13 lines 49-55].

16. As per claim 3, Goldenberg-Malek disclose maintaining a control structure comprising an entry corresponding to each bucket of said single memory structure; wherein each entry in said control structure that is a member of a linked list associated with a queue pair is configured to identify a next control structure entry and a next single memory structure bucket in said linked list [Malek, col 7 line 45-col 8 line 4, Fig 8].

17. As per claim 4, Goldenberg-Malek disclose updating a first entry in said control structure to reflect said storage of said portion of the communication [Gooldenberg, control queue 84, Fig 5, update the next field, col 14 lines 1-6].

18. As per claim 5, Goldenberg-Malek disclose updating an indicator configured to indicate a level of InfiniBand packets stored in said single memory structure for said first queue pair [Gooldenberg, update the next field descriptor in the queue, col 14 lines 1-6].

19. As per claim 6, Goldenberg-Malek disclose updating an indicator configured to indicate a level of InfiniBand packets stored in said single memory structure for said first virtual lane [Gooldenberg, update the next field descriptor in the queue, col 14 lines 1-6].

20. As per claim 7, Goldenberg-Malek disclose prior to said storing: determining whether sufficient space is available in said single memory structure to store said portion of the communication [Goldenberg, segments are available to be written to in memory, col 13 lines 49-53].

21. As per claim 8, Goldenberg-Malek disclose said determining whether sufficient space is available comprises: determining an amount of space in said single memory structure used to store portions of communications received via each queue pair belonging to said first virtual lane, including said first queue pair; and comparing a sum of said determined amounts of space to an amount of space in said single memory structure allocated to said first virtual lane [Goldenberg, available bandwidth, col 5 line 5].

22. As per claim 9, Goldenberg-Malek disclose said determining whether sufficient space is available comprises: determining an amount of space in said single memory structure used to store portions of communications received via said first queue pair; and comparing said determined amount of space to an amount of space in said single memory structure dedicated to said first queue pair [Goldenberg, segments are available to be written to in memory, col 13 lines 49-53].

23. As per claim 10, Goldenberg-Malek disclose said determining whether sufficient space is available further comprises: if said determined amount of space exceeds said dedicated amount of space, determining whether a portion of said single memory structure used to store portions of communications received via multiple queue pairs

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has space available for storing said portion of the communication [Goldenberg, segments are available to be written to in memory, col 13 lines 49-53].

24. As per claim 11, Goldenberg-Malek disclose said determining whether sufficient space is available comprises: determining a number of buckets in said single memory structure used to store portions of communications received via said first queue pair; and comparing said number of buckets to a threshold number of buckets allocatable to said first queue pair [Malek, control system testing, col 5lines 45-50].

25. As per claim 12, Goldenberg-Malek disclose said single memory structure is a multi-port random access memory component [Goldenberg, GE I/O 76, Fig 4].

26. As per claim 13, Goldenberg-Malek disclose said control structure is a multi-port random access memory component [Goldenberg, FIFO controller 81, Col 12 lines 16-35].

27. As per claim 14 Goldenberg discloses A computer readable medium storing instructions that, when executed by a computer, cause the computer to perform a method of buffering InfiniBand queue pairs in a single memory structure, the method comprising:

receiving an InfiniBand packet comprising a portion of a communication to be transmitted on a non-InfiniBand communication link [Goldenberg, Infiniband 24 and WAN 30, Fig 1];

identifying a first queue pair to which the InfiniBand packet belongs [Goldenberg, queue pair, col 10 line 45; scheduling queues, Fig 5];

identifying a first virtual lane to which said first queue pair belongs [Goldenberg, virtual lane, col 2 line 64];

However Goldenberg does not explicitly detail

storing said portion of the communication in a first bucket of a single memory structure, wherein said single memory structure is configured to store contents of InfiniBand packets received from multiple queue pairs; and for each of the multiple queue pairs, including said first queue pair, maintaining an associated linked list of buckets in said single memory structure in which contents of InfiniBand packets belonging to the queue pair are stored.

In the same endeavor, Malek taught a method and apparatus for improving the scheduling of a data processing system using a cache coherency mechanism and an alternative approach to the utilization of a single header cache line (or single memory structure) wherein the multiple entries can be queued via a linked list [Malek, col 7 line 45-col 8 line 4, Fig 8];

Therefore it would have been obvious to an ordinary skill in the art at the time the invention was made to incorporate the entries or buckets of said single memory structure in which contents of packets of the communication stream are stored are linked via a linked list as taught by Malek into the Goldenberg's apparatus in order to utilize the single memory structure.

Doing so would provide mechanism for managing quality of service to multiple hosts sharing a NIC.

28. Claims 15-16 and 24-26 contain identical limitations set forth in claims 34-41. Therefore claims 15-16 and 24-26 are rejected for the same rationale set forth in claims 34-41.

Claim Rejections - 35 USC § 102

Claims 17-32 are rejected under 35 U.S.C. 102(e) as being anticipated by Goldenberg et al [Goldenberg 7,245,627 B2].

29. As per claim 17, Goldenberg discloses In a communication device coupled to an InfiniBand network, a method of sharing one memory structure among multiple queue pairs, the method comprising:

receiving packets for each of multiple queue pairs terminating at the communication device [Goldenberg, queue pairs, col 10 line 45; scheduling queues, Fig 5]; and for each of said queue pairs:

reassembling in a shared memory contents of said packets into communications to be transmitted to an external communication system [Goldenberg, share a single port by a NIC, col 3 lines 50-53; reassembled, col 12 line 15];

maintaining an associated linked list identifying locations in said shared memory in which said communications are reassembled [Goldenberg, a linked list, col 13 lines 49-55]; and

tracking the amount of said shared memory being used to store contents of packets received via said queue pair [Goldenberg, monitoring NIC, col 11 lines 44-55].

30. As per claim 18, Goldenberg discloses for each of one or more virtual lanes, tracking the amount of said shared memory being used to store contents of packets received via said virtual lane [Goldenberg, virtual lane, col 2 line 64].

31. As per claim 19, Goldenberg discloses as said packets are received from the InfiniBand network, queuing said contents directly into said shared memory; wherein said shared memory serves as receive queues for each of said multiple queue pairs [Goldenberg, queue pairs, col 10 line 45].

32. As per claim 20, Goldenberg discloses said received packets comprise portions of encapsulated Ethernet packets [Goldenberg, encapsulate Ethernet frame, col 11 liens 60-67].

33. As per claim 21, Goldenberg discloses said maintaining an associated linked list for a first queue pair comprises: maintaining a head pointer configured to identify: a first location in said shared memory in which contents of a first packet are stored; and a first entry in a shared control structure, said first entry corresponding to said first location in said shared memory; and maintaining a tail pointer configured to identify: a final location in said shared memory in which contents of a final packet are stored; and a final entry in said shared control structure; wherein each entry in said shared control structure that is part of said first linked list, except for said final entry, identifies a subsequent entry in said shared control structure and identifies a location in said shared memory corresponding to said subsequent entry [Goldenberg, a head and tail pointers, col 13 liens 55-65; a linked list, col 15 lines 24-39] .

34. As per claim 22, Goldenberg discloses managing said linked lists for said queue pairs with a shared control; wherein each said location in said shared memory corresponds to an entry in said shared control; and wherein each entry in said shared control is configured to identify: a subsequent entry within the same linked list as said entry; and a location in said shared memory corresponding to said subsequent entry [Goldenberg, NIC sharing over IB fabric, col 17 lines 42-63].

35. As per claim 23 Goldenberg discloses A computer readable medium storing instructions that, when executed by a computer, cause the computer to perform a method of sharing one memory structure among multiple queue pairs, the method comprising:

receiving packets for each of multiple queue pairs terminating at the communication device [Goldenberg, queue pairs, col 10 line 45; scheduling queues, Fig 5]; and for each of said queue pairs:

reassembling in a shared memory contents of said packets into communications to be transmitted to an external communication system [Goldenberg, share a single port by a NIC, col 3 lines 50-53; reassembled, col 12 line 15];

maintaining an associated linked list identifying locations in said shared memory in which said communications are reassembled [Goldenberg, a linked list, col 13 lines 49-55]; and

tracking the amount of said shared memory being used to store contents of packets received via said queue pair [Goldenberg, monitoring NIC, col 11 lines 44-55].

36. As per claim 27 Goldenberg discloses A method of storing a communication received from an InfiniBand network, the method comprising:

receiving a set of InfiniBand packets from an InfiniBand network, each said InfiniBand packet comprising a portion of a communication [Goldenberg, Infiniband 24, Fig 1];

storing said communication portions in a memory shared among multiple queue pairs of the InfiniBand network, including a first queue pair through which said set of InfiniBand packets is received [Goldenberg, share a single port by a NIC, col 3 lines 50-53; reassembled, col 12 line 15]; and

maintaining a first linked list for said first queue pair to identify locations in said memory in which said communication portions are stored [Goldenberg, a linked list, col 13 lines 49-55].

37. As per claim 28, Goldenberg discloses said storing comprises reassembling said communication portions into said communication [Goldenberg, reassembled, col 12 line 15].

38. As per claim 29, Goldenberg discloses said maintaining a first linked list comprises: in a control structure, maintaining a first linked list of control entries, wherein each of said control entries except a final control entry identifies: a subsequent control entry; and corresponding to said subsequent control entry, a location in said memory in

which data received through said first queue pair are stored [Goldenberg, a linked list, col 13 lines 49-55].

39. As per claim 30, Goldenberg discloses said maintaining further comprises: maintaining a head pointer identifying a first control entry in said first linked list and a first location in said memory; and maintaining a tail pointer identifying said final control entry in said first linked list and a final location in said memory [Goldenberg, a head and tail pointers, col 13 line 60].

40. As per claim 31, Goldenberg discloses A computer readable medium storing instructions that, when executed by a computer, cause the computer to perform a method of storing a communication received from an InfiniBand network, the method comprising:

receiving a set of InfiniBand packets from an InfiniBand network, each said InfiniBand packet comprising a portion of a communication [Goldenberg, Infiniband 24, Fig 1];

storing said communication portions in a memory shared among multiple queue pairs of the InfiniBand network, including a first queue pair through which said set of InfiniBand packets is received [Goldenberg, share a single port by a NIC, col 3 lines 50-53; reassembled, col 12 line 15]; and maintaining a first linked list for said first queue pair to identify locations in said memory in which said communication portions are stored [Goldenberg, a linked list, col 13 lines 49-55].

41. As per claim 32, Goldenberg discloses said maintaining a first linked list comprises: in a control structure, maintaining a first linked list of control entries, wherein each of said control entries except a final control entry identifies: a subsequent control entry; and corresponding to said subsequent control entry, a location in said memory in which data received through said first queue pair are stored [Goldenberg, a linked list, col 13 lines 49-55].

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thong H. Vu whose telephone number is 571-272-3904. The examiner can normally be reached on 6:00-3:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, *Lynn Feild* can be reached on 571-272-2092. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Thong Vu
Primary Examiner



THONG VU
PRIMARY PATENT EXAMINER